EVALUATION STUDY OF
RECENTLY COMPLETED
SMALL NAVIGATION PROJECT FOR
ANDREWS RIVER, MASSACHUSETTS

DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASSACHUSETTS 02154

SEPTEMBER 1971

EVALUATION STUDY OF RECENTLY COMPLETED SMALL NAVIGATION PROJECT FOR ANDREWS RIVER, MASSACHUSETTS

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

IN REPLY REFER TO

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EVALUATION STUDY OF RECENTLY COMPLETED SMALL NAVIGATION PROJECT FOR ANDREWS RIVER, HARWICH, MASSACHUSETTS

1. General. This study is made in response to the request of the Board of Selectmen of the town of Harwich made by letter of 2 October 1970 (a copy is inclosed). The town made the request because of repeatedly expressed concern of local property owners about problems related to our recently completed project, particularly shoaling of the channel and serious erosion of the shorefront immediately west of the project. Local property owners have corresponded and held meetings with representatives of the town and the New England Division on several occasions to discuss the problem. The town desires that the project be re-evaluated to determine the need for construction of the west jetty (deferred construction in the authorized project) or some modification thereof. The Chief of Engineers allotted funds for the study in October 1970. See APPENDIX A for letters pertaining to the project.

2. Location and Description. The project is located about 85 miles south of Boston, Massachusetts in the town of Harwich. Specifically, it is located just east of Wychmere Harbor at the mouth of the Andrews River on Nantucket Sound, (see PLATE 1).

3. The project was adopted on 3 May 1965 by the Chief of Engineers under authority of Section 107 of the 1960 River and Harbor Act. It provides for a channel 6 feet deep and 75 feet wide extending from deep water in Nantucket Sound to the vicinity of a recently completed State-town marina, two jetties to stabilize the harbor entrance, and a 3-acre maneuvering and anchorage basin. The marina was the major required item of local cooperation.

4. The east jetty was completed in June 1967. The west jetty was deferred pending definite determination of its needs. The channel and anchorage were completed in 1968.

5. The Problem. The problem appears to involve several factors. These include erosion of a sector of shorefront immediately west of the entrance to Andrews River, shoaling of the entrance channel, and choppy wave action experienced at the channel entrance due to short period waves during onshore sea breezes. These waves are modified by some reflection from the east jetty and a nearby revetment structure. The erosion includes about 200 feet of the backshore area immediately west of the entrance channel. A property owner located within this sector has experienced a serious problem along a portion of his shorefront property resulting in lowering of the beach and moderate damage to the aforementioned protective revetment. These damages have required structural repairs and additional erosion control work by the property owner. Since his additional improvements were completed, (stone revetment sealed with concrete that fronts an embankment and a sector of dunes), a substantial portion of his structure has been overtopped and flanked, resulting in substantial undermining and deterioration. Natural unprotected dunes forming the backshore and extending east of the structure to the channel are experiencing erosion during frequent severe storms. See PHOTOS 1 through 4 demonstrating this problem.

6. The beach backshore and foreshore along the damaged sector is now very rocky in contrast to the beach sand shorefront that existed prior to the construction of the navigation project. During dredging of Wychmere Harbor by the Commonwealth of Massachusetts, about ten years ago, a substantial amount of sand was pumped into the beach between Wychmere Harbor and the Andrews River. A stony, ridge-shaped bar extending seaward for some distance adjacent to and paralleling the western edge of the navigation channel has formed. Apparently, this also forms a portion of the material that is shoaling along the western portion of the entrance channel within the limits of and paralleling the east jetty structure. The rocky condition of the immediate backshore and nearshore area, with a scoured narrow sector of beach paralleling and adjacent to the stony bar, indicates the severity of erosion. The scouring action appears to be extending in a westerly

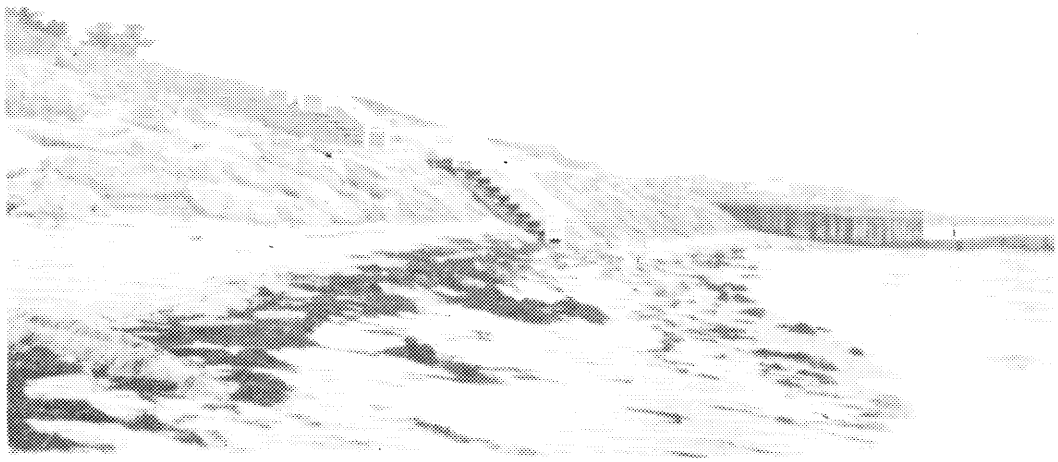


PHOTO 1., AUGUST 1969. Looking east at revetment along front of private property west and adjacent to Andrews River at mid-tide.

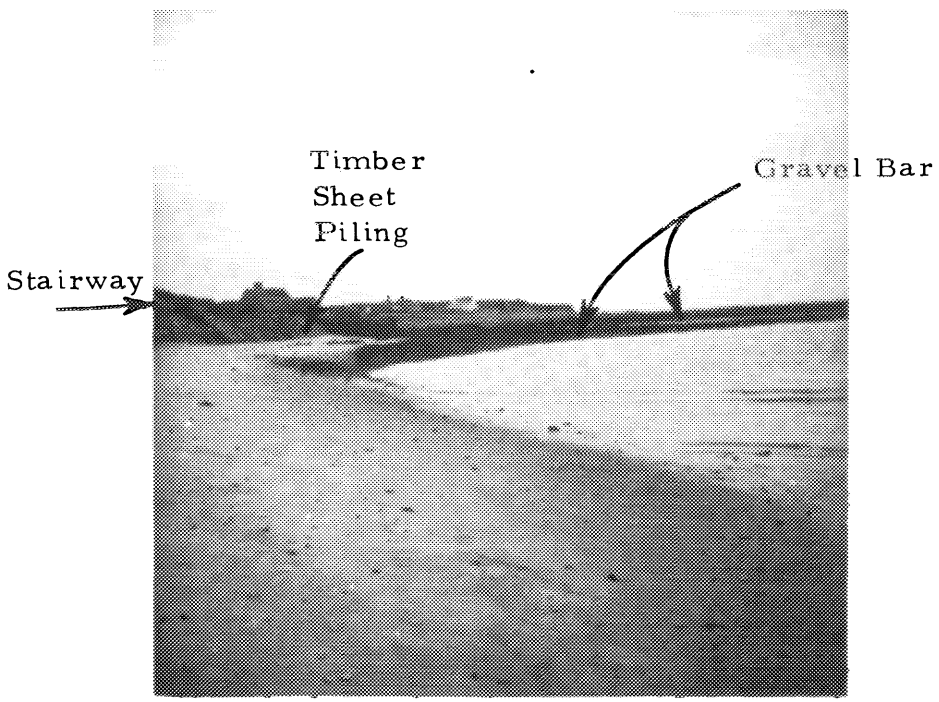


PHOTO 2., DECEMBER 1970. Looking along this private beach area, about one year later. Note rock deposits, now exposed top of timber sheet piling, and inner end of gravel bar, demonstrating erosion fronting private property.

PHOTO 3., AUGUST 1969. Looking at reveted portion of privately-owned shorefront on west bank of river. Note continuing erosion of backshore adjacent to revetment.

PHOTO 4., DECEMBER 1970. Private property owner extends revetment, erosion continues. Recommended improvement would tie into this structure and protect eroding dunes.

direction, with loss of some sandy beach. The problem occurs during storms with tide levels higher than normal. Storm-driven waves then overtop the backshore resulting in substantial erosion of backshore dunes and damage to revetment structures. Apparently, a combination of wave reflection from the backshore revetment and the east jetty combined with wave refraction processes play a major role in causing the problem. See PHOTOS 2 through 6 portraying the erosion along the backshore and formation of the gravel bar.

7. Design Analysis. The analysis of the problem includes a study of the several factors that relate to the problem. These factors are discussed as follows:

a. Design Tide and Storms. The normal tide range is 3.7 feet with a spring range of 4.1 feet. During the more frequent serious storms for this area, southerly winds prevail (southeast through southwest). Although this area is subject to damaging hurricanes and extraordinary storms accompanied by exceptionally high tide levels and damaging waves, their rare occurrence precludes the economic and practical feasibility of a design completely resistant to hurricane and extraordinary storm wave force damage.

The detailed project report study estimated that a storm of about once-a-year frequency would have a tidal surge of 2 feet above mean high water (a stillwater level of 5.7 feet above mean low water). A storm tide level of about 6.7 feet above mean low water (3 feet above mean high water), might be expected to occur during exceptional storm conditions or a low level hurricane occurring with a frequency of between 1 in 5 to 10 years. The design tide is selected as 5.7 feet above mean low water, in accordance with the completed study, as a practical and reasonable flood level for the analysis of the problem, with some adjustments for wave height computation and wave runup as discussed below.

b. Wave Height. The more frequent storm-driven waves generally approach from the southeast through the southwest. The larger deep water ocean waves approaching the entrance to Nantucket Sound during east and northeast storms are reduced by refraction to a height equal to or less than that of damaging waves developed within the sound during the southerly storms over the available fetch distance (maximum of 25 nautical miles from the south-southeast). An 8-foot significant wave is believed to be representative for the more southerly storms. This agrees with

wave parameters studied in the detailed project report. The design wave height for the jetty is that height which can be supported at the toe of its slope. It is equivalent to 0.78D where D is the depth of water (stillwater level) occurring at the toe of the jetty slope, during the design storm. Design of the revetment was based on a wave height larger than that which could be supported at the toe of the revetment or dune to provide an allowance of some erosion at the toe. A storm-driven wave of 6 feet was used for the design of the exposed outer sector of the jetty structure. A wave height of 4 feet was used for computing the wave runup and the design of the backshore revetment.

c. Wave Runup. The significance of the wave runup is primarily to determine the degree of overtopping of the dunes and alongshore revetment, particularly with respect to undermining the revetment and erosion of the dunes. The determination of wave runup considers the once-a-year frequency storm and also the rare storm of once in 5 to 10 years (6.5 second waves). The wave runup computations are based on a rubble rockfill revetment placed on a slope of 1.5 horizontal on 1.0 vertical along the face of dunes. The elevation of the wave runup is tabulated as follows:

	Stillwater Level Feet m.l.w.	Wave Height feet	Elevation Wave Runup	Top Dune Elev.
	5.7	4	11	9.0
(1)	6.7	5	12	9.0

(1) The structure is designed for the more frequent storms; however, a rare storm of 5 to 10 year frequency is found to be only slightly more severe with little or no increased maintenance required above that required for the frequent storms. A gravel and rock apron along the backside of the structure would provide protection against some wave overtopping.

d. Wave Refraction and Diffraction. A wave refraction analysis was made for the more frequent southerly storms (southeast through southwest). A 6.5 second wave period was selected as representative for the area based on the wave analysis completed in the detailed project report study. Wave diffraction as caused by the Wychmere Harbor jetty structure was also included in the analysis. There is no appreciable wave diffraction experienced at the time of maximum storm conditions afforded by the east jetty for the Andrews River project. The top elevation of the structure, 6.5 feet above mean low water, only about 1 foot above the elevation of the design storm (5.7 feet above mean low water), allows storm-driven waves to generally sweep unrestricted over the structure. A discussion of each wave approach is discussed as follows:

(1) Southeast Approach. The wave analysis for the southeast wave approach is as demonstrated by the orthogonal plot on PLATE 6 and includes the effects of wave diffraction at the Wychmere Harbor jetty structure. The littoral movement of material is to the west, west of the Wychmere Harbor jetty with an eastward trend within the Andrews River - Wychmere Harbor complex. To the east of the entrance, it is generally offshore. Storm wave convergence is experienced along the sector of backshore extending 200 feet west of the Andrews River entrance channel. Wave diffraction and divergence greatly reduces the wave height along the sector of shore immediately east of Wychmere Harbor. Thus, the beach width in this sector remains substantially wider than the remainder of the beach to the east where increased wave energy causes a more rapid alongshore and offshore loss of material.

(2) Southwesterly Approach. Very strong eastward littoral movement of material is demonstrated by the orthogonal plots as shown on PLATE 7. The Wychmere Harbor jetty structure affords substantial reduction of wave heights along much of the western portion of shorefront within the Wychmere Harbor-Andrews River sector, thus greatly minimizing the movement of material at the vicinity of Wychmere Harbor, but with increasing eastward movement experienced along the eastern sector to the converging area at the 200-foot sector adjacent to the west entrance to Andrews River.

(3) Southerly Approach. The pattern of littoral drift, as demonstrated by the orthogonal plot on PLATE 8, shows a much weaker tendency toward littoral movement, than the southeasterly and southwesterly storm wave approaches. Although there is a slight tendency of westerly movement, west of the Wychmere Harbor jetty and eastward, east of the Andrews River jetty, the predominant movement appears to be offshore. The movement within the Wychmere Harbor-Andrews River complex is reduced through diffraction along the western sector. Similar to the southwesterly and southeasterly approach, substantial convergence of wave energy occurs at the bar that extends normal to the backshore and generally paralleling the western edge of the Andrews River channel.

8. Shoaling - Comparative Profiles. Based on the comparative profiles as shown on PLATES 2 through 4 of the surveyed condition of the channel before construction (1966), after construction (1968) and one year later (1969), a computation of shoaling quantities has been made. The major proportion of the shoaling material is located within the channel limits of the east jetty structure and the inner channel immediately within the mouth of the river (see PLATE 5 for cross sections). During a period of one year, since construction of the project, the amount of shoaling material within this area amounted to 5,800 cubic yards. There is little or no shoaling within the outer channel limits. No comparative surveys were taken in the inner harbor area but it is estimated that at least an additional 3,000 cubic yards attributed to movement from the outer shorefront has moved into the inner harbor. Thus a total of about 8,800 cubic yards of shoaling has occurred within one year since construction of the project or more than twice the estimated maintenance requirement as determined in the detailed study.

9. The characteristics of the shoaling material are not positively known, because a costly foundation analysis including coring data was not made. Based on visual observations made, during periods of low tides, a large proportion of the material is likely gravelly, similar to the stony nature of material forming the bar that extends seaward paralleling the western side of the entrance channel. This type of material apparently forms much of the geological structure of the nearshore area where storm-driven waves have removed most of the fines. A substantial amount of fines probably moves into the channel, however, through the predominant easterly drift of material either from the backshore of the Wychmere Harbor-Andrews River sector, or by material moving around the outer arm of the Wychmere Harbor jetty and beyond its effective area of diffraction.

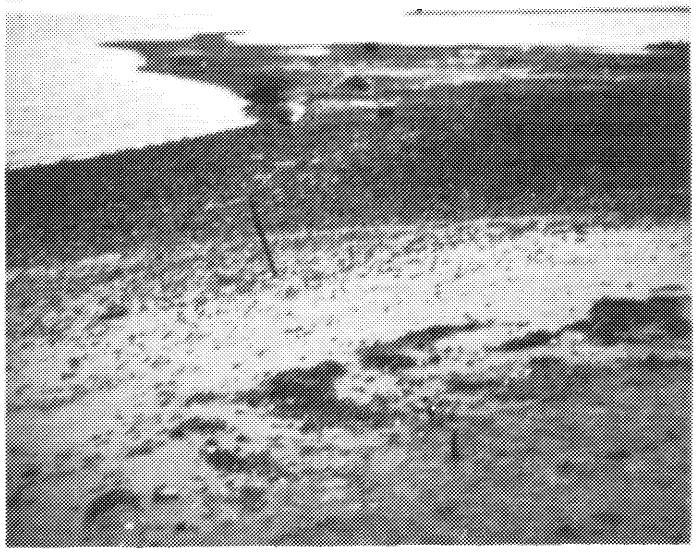


PHOTO 5., DECEMBER 1970. Looking soundward at low tide, along the bar that has formed along west side of the Andrews River.

PHOTO 6., DECEMBER 1970. Looking inland at about low tide along the stony bar.

10. Discussion of Processes and Protective Measure. There are several factors that relate to the shoaling problem. Of major importance, is the predominant easterly direction of littoral drift experienced during frequent storms (southwesterly through southeasterly storms). Substantial quantities of materials are, therefore, transported littorally toward the channel. Millions of cubic yards of sand are available along the flat shallow nearshore and sandy backshore area to the west of Andrews River and east of the Wychmere Harbor jetty. The project is located outside the limit of substantial diffraction capability of the Wychmere Harbor jetty. The predominant easterly drift of material is physically demonstrated by the build up of beach sand on the west side of groins and the Wychmere Harbor jetty structure as portrayed by PHOTO 7. The channel is actually a 6-foot by 75-foot wide cut through the beach proper, with the east jetty extending seaward to a shallow depth (2 feet below mean low water) and paralleling the eastern edge of the channel. Prior to construction of the channel, the natural discharge of the river extended over a broad width to the east and west of the natural channel with the deepest natural channel depth through the backshore then ranging only up to 1 foot below mean low water. The flood and ebb tide flows were then quite rapid during low tides. As a result, the tidal flow velocity swept substantial amounts of fine material along in the tidal current forming a sandy and gravelly delta at the mouth (see PHOTO 7).

11. Under the present conditions, during the period of near low tide, the tidal flow, somewhat confined by the east jetty, is observed to spread out over some distance beyond the channel bank westward over the beach for some distance. A scoured sector immediately west of and paralleling the ridge of material that extends along the west edge of the channel is observed. Storm-driven wave action with some reflection from the privately-owned smooth face revetment extending along this sector of backshore coupled with the flood and ebb currents appears to expedite losses from the scoured sector of the deeper channel where a stilling basin effect occurs to cause a settling out of the transported material at the edge of the channel. As the bar at the edge of the channel forms, this causes a peaking of the waves with rapid sorting out and directing of a substantial amount of material to the channel. The reflection of waves from the east jetty, with some degree of diffraction experienced, adds to settling of materials within the channel.

12. A protective measure to effectively reduce the shoaling within the channel must include revetting the erodible backshore contained between the western edge of the entrance channel and the privately constructed nearby alongshore revetment that terminates about 100 feet west of the channel. It will also require a jetty structure paralleling the west edge of the channel and the existing east jetty structure, tying into the alongshore revetment and terminating the same distance seaward as the east jetty. This would be the minimum improvement necessary to reduce the large quantity of material that is being transported littorally to the channel primarily within the backshore and nearshore beach area. The improvement is essentially as considered for deferred construction in the detailed project report study. It is modified to include shortening of the seaward portion of the jetty to the equivalent termination distance of the east jetty structure and adding revetment along the backshore. The improvement is described in detail below.

13. Plan of Improvement. The plan of improvement as shown on PLATE 9 provides for a 700-foot long stone jetty structure along the west side of the entrance channel parallel to the existing east jetty, and tying into revetment that extends along the backshore, the revetment terminating about 100 feet west of the channel at the eastern extremity of existing revetment fronting private property. The revetment has a top elevation averaging 9.0 feet above mean low water fronting dunes or embankment and has a seaward slope of 1.5 horizontal on 1.0 vertical. A 5-foot wide bedding layer behind the top face should be provided to minimize wave runup erosion that could be experienced during extraordinary storms. The jetty structure is as designed in the detailed project report having a general top elevation of 6.5 feet above mean low water; a five foot top width (6.0 feet for about a 250-foot sector of the outer extremity) and side slopes of 1.5 horizontal on 1.0 vertical.

14. Estimated Cost. The cost of construction of the project is predicated on the 1971 unit price level of labor and materials prevailing within the area as itemized below.

PHOTO 7., APRIL 1965. Looking west toward Wychmere Harbor Jetty and Andrews River at time of near high tide. Note predominant easterly drift as demonstrated generally by sand buildup on west side of jetty and groins and sandy delta at mouth of Andrews River.

Description	Quantity	Unit	Unit Cost	Cost
JETTY STRUCTURE				
Armor Stone	1800	tons	$18.00	$ 32,400
Core Stone	1500	tons	15.00	22,500
Bedding Stone	1300	tons	10.00	13,000
Revetment structure	(Estimated 100 linear feet)		L.S.	5,000
		Sub-Total		$ 72,900
		Contingencies		13,100
		Sub-Total		$ 86,000
		Engineering & Design		10,000
		Sub-Total		$ 96,000
		Supervision & Administration		9,000
		TOTAL COST		$105,000

15. Annual Charges. The interest rate for the project is computed at 5-3/8 percent with a useful project life of 50 years used for amortization charges. The maintenance of the revetment and jetty structure is estimated to require annual repair equivalent to the replacement of 2 percent of the armor stone based on experience of maintenance work for similar structures in the area. The unit cost of armor stone has increased over the previous estimate included in the detailed project report to allow for increased cost of labor and material and to allow for the smaller quantity of stone required. The annual charges are tabulated below.

ANNUAL CHARGES	
Interest (0.05375 x $105,000)	$ 5,650
Amortization (0.00423 x $105,000)	450
Maintenance (jetty & revetment) (40 tons x $25.00)	1,000
TOTAL ANNUAL CHARGES	$ 7,100

16. Benefits. The benefits derived by construction of the alongshore revetment and west jetty structure is based on the estimated reduction in the cost of maintenance dredging as afforded by providing the structure. The annual shoaling is estimated at 8,800 cubic yards per year within the channel area affected by the improvement. The annual shoaling as estimated in the detailed project study, without benefit of shoaling data, was 3,800 cubic yards. This allowed for about 1,300 cubic yards per year within the inner area (two thirds of the loss estimated to be experienced in the outer channel) or represents an error (based on an educated estimate only), of about 7,500 cubic yards a year, as determined using the comparative surveys. It is reasonable to believe that with the large amount of easterly drifting material that is experienced within the area, that the computed quantity of 8,800 cubic yards a year determined from survey material is a firm estimate of annual shoaling likely to be experienced annually. It is estimated that the reduction in shoaling of the channel afforded by the west jetty structure will be at least 60 percent of the overall inner shoaling quantity or 5,300 cubic yards a year. The unit cost of dredging within this area for a project of this magnitude is estimated at $5.00 a cubic yard resulting in an annual benefit of $26,500.

17. Justification. The construction of the west jetty and additional alongshore revetment is easily justified based only on decreased shoaling of the entrance channel. Although there are other benefits, such as reduction in loss of private land and therefore land enhancement benefits, and an improved small boat entrance through some reduction in wave heights that are now occurring at the entrance mouth during ordinary high tides accompanied by sea breezes or local storms. Based on the annual charges computed at $7,100 and annual benefits of $26,500, the benefit to cost ratio is 3.8.

18. Conclusions. In summary, the detailed analysis of storm-driven waves, coupled with field observations, determine a predominant direction of alongshore littoral drift to be in an easterly direction. Analysis of the before and after construction condition surveys for the project determine that shoaling within the entrance and near inner channel is serious and estimated at 8,800 cubic yards annually. This greatly exceeds the detailed project study estimate.

19. The east jetty structure and privately constructed alongshore revetment, the latter located about 100 feet west of the entrance channel, appear to play an important role in the beach erosion and shoaling processes. Storm-driven waves occurring during periods of higher tide levels experience some degree of reflection from the structures. The privately constructed revetment, smooth faced and sealed by concrete, reinforce the reflection processes and alongshore littoral current, thus expediting erosion of the beach area and shoaling of the channel. The tidal ebb and flood flows during periods of lower tidal levels is diverted and spread westward of the channel proper increasing losses of beach fines from the backshore.

20. A corrective improvement must be designed to accrete a substantial amount of alongshore littorally drifting material from shoaling the channel, particularly within the backshore and nearshore beach area, this being mainly within the limits of the east jetty structure. It must also protect the backshore immediately west of the channel from further erosion.

21. The type of improvement required would be a jetty structure along the west bank of the entrance channel paralleling the east jetty structure and terminating at the same distance seaward as the east jetty structure and tying into alongshore revetment structure that would extend westward to the privately constructed revetment, the revetment to protect against flanking of the jetty. This improvement would also, in addition to confining the tidal flow to the design channel limits, improve the channel as an entrance for small recreational boats.

22. Recommendations. It is recommended that the improvement, as shown on PLATE 9 be constructed. This improvement consists of a 700-foot long jetty structure extending along the west side of the channel paralleling the east jetty and tying into alongshore revetment that terminates at the privately constructed revetment about 100 feet west of the channel.

23. It is estimated that the cost of the improvement, shared equally with local interests, would be $105,000, about $45,000 greater than the detailed project estimate for construction of the deferred structure; the increase costs mainly incurred for inflationary costs of labor and material and addition of needed alongshore revetment to prevent flanking of the structure.

APPENDIX A

TOWN OF HARWICH

Office of Selectmen • Assessors • Board of Health

Milton H. Welt • Ralph U. Brett • Charlotte W. Morey

HARWICH, MASSACHUSETTS

July 14, 1969

Department of the Army
New Eng. Division-Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

Attention: Mr. Mauriello

Dear Mr. Mauriello:

You will recall correspondence last year and a visit,with the Selectmen, to the property of Mrs. S. S. Gwillim on Harbor Road, Harwich Port just to the west of the entrance to the new channel at Andrews River in regard to erosion allegedly caused by the construction of the new harbor.

We have received a request from Mr. John H. Kreitler, Mrs. Gwillim's son-in-law, to inspect the present situation there and have done so.

It would be greatly appreciated if you could, at your earliest convenience, inspect the property again.

The owners are greatly concerned regarding the continued erosion problem there and would be very much interested in your judgment as to the cause.

Mr. Kreitler lives in New Jersey, but has indicated that if he can be informed of a date you could be in Harwich, he would make arrangements to be present.

With kindest personal regards.

Respectfully,

Board of Selectmen

MHW/h
c.c. to Mr. John Kreitler
186 Highland Ave.
Short Hills, N.J. 07078
c.c. to Mrs. S. S. Gwillim
Harbor Rd., Harwich Port A-1

APPENDIX A

Saint Andrew's Church

MEYER BOULEVARD AND WORNALL ROAD, KANSAS CITY, MISSOURI 64113

The Reverend
PETER G. KREITLER

October 1, 1970

Mr. Russell Train
President's Council on the Environment
Washington, D. C.

Dear Mr. Train,

By way of introduction; let me illustrate why I am writing to you. Two years ago I was one of four seminary assistants to John Harper at St. John's. On several occasions we had the opportunity to chat briefly and you spoke with us on a couple of Sunday mornings in John's office. This letter is to say hello, but also to ask your advice on a matter that deeply concerns me.

The summer property of my family and the property of several other families is being altered greatly as a result of a federally funded harbor recently completed in Harwichport, Massachusetts. The name of the harbor is Saquatucket Bluffs and it was dredged three years ago. This past summer was the first summer of operation. The harbor itself is lovely but the resulting change in the entrance to the harbor and the beach front property causes alarm.

The Army Corp of Engineers constructed a stone jetty on the east side of the entrance to the harbor. At the time of the initial construction of this jetty a second jetty was discussed for the west side. Consequently, the second jetty was not built and to this date nothing further has been done. Our concern is that this second jetty be built for several reasons.

First of all, the movement of water in this area will necessitate continual dredging to keep the channel at the charted level. Presently, many of the boats entering this harbor have either run aground or scraped their hulls because of the rock and sand flats at the

APPENDIX A

entrance of the harbor. The construction of the second jetty would alleviate this problem. Granted, I cannot be termed a waterfront expert, but having spent twenty-eight summers at this particular location has enabled me to speak with some authority about the water and its affects.

This is the area that I feel will be of interest to you in your capacity. We can document with photographs taken from the air and land over the past thirty years that this harbor has resulted in directly altering the beaches directly to the west of its entrance. The sand has been washed away to such a large degree that our family and an association of seventeen families have been forced to protect the property with an expensive rip-rap. Approximately seven thousand and five hundred dollars has been spent on this rip-rap and yet the beach is still eroding. We lost about seven inches of sand in a brief three week period this summer. We fear the winter high tides and hurricanes because the harbor has depleted the protective sands in front of our property. Yes, we have lost beaches to hurricanes in the past and we accept this as part of living on the ocean, yet this harbor has perhaps eliminated our chance of continuing to keep this beautiful property.

My father and many other members of our Wychmere Pines Association have spent long hours talking with the Corp of Engineers, Massachusett's Waterways Department, the Board of Selectmen of Harwich, and the harbor master. As of now no action has been taken and we feel stymied. We get conflicting stories from all sides and no one person is willing to take the responsibility of action. I am writing in hope that someone in your department will be interested in this very real "environmental problem" and can advise us as to where to turn.

If more details are needed as well as photographs I would be happy to have them sent to you. I appreciate your taking time to read this and give my best to John Harper and the members of St. John's.

Thank you,

Sincerely,

Peter

The Rev. Peter G. Kreitler

PGK/rl

TOWN OF HARWICH

Office of Selectmen • Assessors • Board of Health

Charlotte W. Morey • Douglas Rockwood • Donn B. Griffin

HARWICH, MASSACHUSETTS

October 2, 1970

Division Engineer
U.S. Army Engineers
New England Division
424 Trapelo Street
Waltham, Mass.

Dear Sir:

We would appreciate your investigation of the feasibility of a second jetty at Andrews River.

During your study, the Waterways Committee, Richard T. Wales, Chairman would appreciate a meeting with you, and our Board.

As you recall, there is money being held in escrow for the construction of a second jetty if you determine that it is needed.

We would appreciate hearing from you at your earliest convenience.

Respectfully,

Charlotte W. Morey
Donn B. Griffin
Douglas Rockwood
Board of Selectmen

CWM/h

Coe Elizs/am
cw-o

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
722 JACKSON PLACE, N. W.
WASHINGTON, D. C. 20006

DEC 22 1970

Dear Reverend Kreitler:

Thank you for your letter of October 1, 1970, inquiring about the possibility of further construction by the Army Corps of Engineers on the harbor at Harwichport, Massachusetts. I remember our meeting at St. Johns and will try to see that your questions get an answer.

By copy of this letter I am asking the Corps of Engineers to respond to the questions you have raised, with a copy to me.

Sincerely,

(sgd) Russell E. Train

Russell E. Train
Chairman

Reverend Peter G. Kreitler
Saint Andrew's Church
Meyer Boulevard & Wornall Road
Kansas City, Missouri 64113

cc: Col. James B. Newman

ENCCW-ON 29 January 1971

The Reverend Peter G. Kreitler
Saint Andrew's Church
Meyer Boulevard and Wornall Road
Kansas City, Missouri 64113

Dear Reverend Kreitler:

This is in further reply to your recent letter to Mr. Russell E. Train, Chairman of the President's Council on Environmental Quality, concerning the navigation improvement project at Barwichport, Massachusetts.

The authorized Federal navigation improvement project for Sacustucket Harbor (formerly known as Andrews River), provides for a channel 6 feet deep and 75 feet wide extending from deep water in Nantucket Sound to the vicinity of the state-town financed marina; two jetties to stabilize and protect the harbor inlet; and a 3-acre maneuvering and anchorage basin adjacent to the marina. Construction of the east jetty was completed in June 1967. Dredging of the channel and anchorage was completed in April 1968. As a result of discussions with coastal engineers, construction of the west jetty was deferred pending conclusive evidence of its need.

Since completion of the above work the New England Division Engineer has made hydrographic surveys to determine the post-construction condition in the channel and field observations during several tidal ranges to determine if the project is functioning in accordance with the project design. The problems within the project area have also been the subject of meetings with town officials (including your father) and other affected property owners.

On 13 October 1970, this office authorized and funded an evaluation study to be completed by the New England Division to determine the need for the construction of the deferred west jetty or some modification thereof. This study is being made at the request of the Board of Selectmen, town of Barwich, by letter to the Division Engineer dated 2 October 1970.

ENGCW-OM 29 January 1971

The Reverend Peter G. Kreitler

The Division Engineer advises me that this study which is considering all factors pertinent to the problem, including those raised by your questions, should be completed in the near future. The town of Harwich will be promptly notified of our findings upon completion of the study.

Sincerely yours,

LEONARD EDELSTEIN
Colonel, Corps of Engineers
Assistant Director of Civil Works
for Atlantic Divisions

CF: NEW ENGLAND DIVISION

TOWN OF HARWICH

Office of Selectmen • Assessors • Board of Health

Donn B. Griffin Charlotte W. Morey Haden G. Greenhalgh

HARWICH, MASSACHUSETTS

April 13, 1971

Mr. John Wm. Leslie
Chief, Engineering Division
U.S. Army Corps of Engineers
Waltham, Mass. 02154

REFERENCE: NEEDED_R

Dear Mr. Leslie:

On October 2, 1970 the Board of Selectmen wrote you requesting a study of the feasibility of a second jetty at Andrews River in Harwich Port.

The Corps had originally planned this jetty but was persuaded to defer action on its construction to study further its need.

During this past winter we have had normal storms and the property directly to the west has lost considerable beach frontage as well as serious damage to the stone bulkhead resulting in the loss of their stairs.

We feel substantial damage to this property in the event of a line storm.

We would appreciate your immediate investigation into this matter.

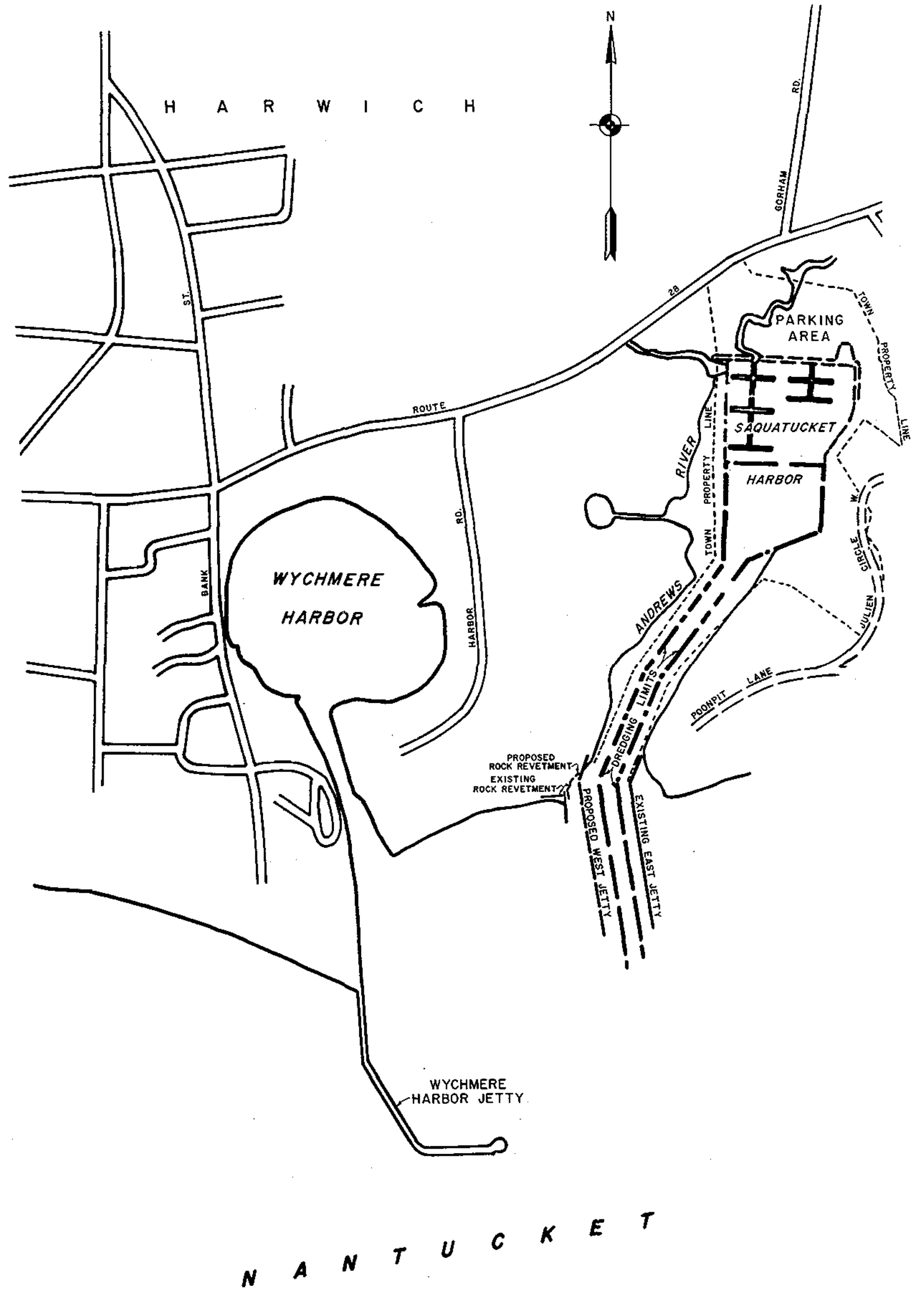
Sincerely,

Board of Selectmen

DBG/b

c.c. to: Mr. William Kreitler
186 Highland Avenue
Short Hills, N.J.

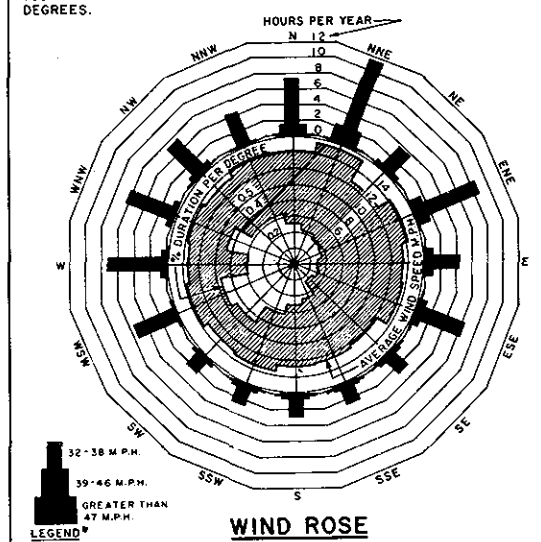
Mrs. Edith P. Gwillim
20 Outlook Avenue
West Hartford, Conn. 06107



*DURATION FOR EACH RANGE OF WIND SPEEDS IS MEASURED OUTWARD FROM TOP OF UNDERLYING BAR GRAPH.

NOTE:

PERCENT DURATION PER DEGREE IS THE AVERAGE PERCENT DURATION OBSERVED FOR EACH 16 POINTS OF THE COMPASS DIVIDED BY 22 1/2 DEGREES.



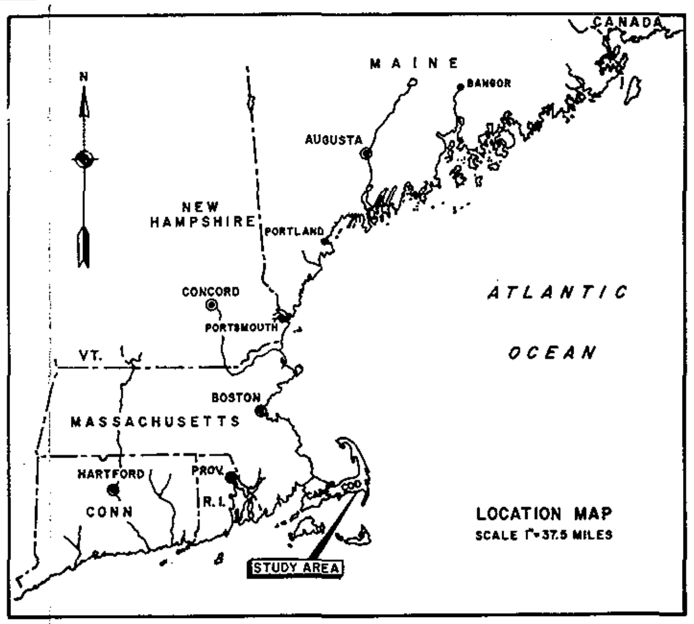
WIND ROSE

MEMORIAL AIRPORT, NANTUCKET, MASS.

AUGUST 1952-JULY 1957 AUGUST 1958-JULY 1960

AUGUST 1961-JULY 1962

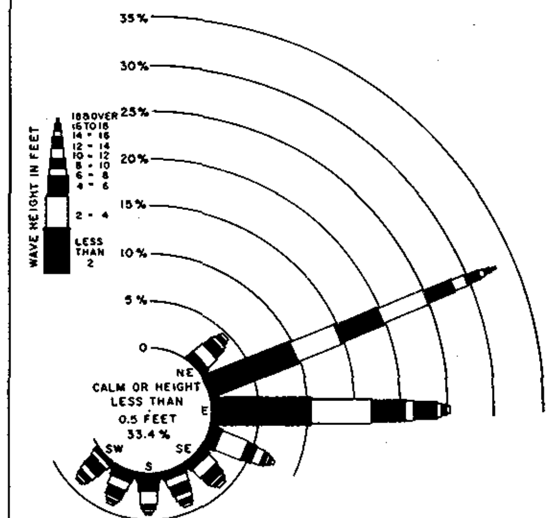
8 YEAR RECORD



LOCATION MAP

SCALE 1" = 37.5 MILES

COMPOSED OF DATA OBTAINED BY HINDCAST OF 3 YEARS OF WIND RECORDS (1948-1950) SHOWING PERCENT OF TIME WAVES OF DIFFERENT HEIGHT OCCUR FROM EACH DIRECTION. FROM BEACH EROSION BOARD TECH. MEMO. NO. 55.



WAVE ROSE

OFF NAUSET BEACH, CAPE COD, MASS.

(LAT. 41° 50' N, LONG. 69° 30' W)

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
C.T.M.	C.T.M.	T.C.B.

SUBMITTED: C. E. Wo[illegible] — PROJECT ENGINEER

Oscar E. Arpin — CHIEF, COASTAL DEVEL. SECT.

EVALUATION STUDY
OF RECENTLY COMPLETED SMALL
NAVIGATION PROJECT
ANDREWS RIVER
HARWICH, MASS.
LOCATION MAP

APPROVAL RECOMMENDED: [signature] CHIEF, PLANNING BRANCH

APPROVED [signature] CHIEF, ENGINEERING DIVISION

DATE MAY, 1971

SCALE 1" = 200'

DRAWING NUMBER

SHEET 1 OF 1

PLATE NO. 1

CORPS OF ENGINEERS

U. S. ARMY

N245,000 E995,000 N245,000 E994,000 N250,000 E993,000 N247,000 E994,000 N244,000 E992,000 N245,000 E993,000 N245,000 E992,000

DREDGING LIMITS

EXISTING EAST JETTY

PROPOSED WEST JETTY

WYCHMERE HARBOR JETTY

FLOOD

EBB

ANCHORAGE

TOWN PROPERTY LINE

Stone Jetty

Conc. Wall

Wood Bulkhead

Proposed Rock Revetment

Existing Rock Revetment

EXISTING MARINA

STEEL AND CONC. SLAB BULKHEAD

TOWN OF HARWICH PROPERTY LINE

PARKING AREA

NOTES

Soundings, probings and borings are in feet and tenths and are referred to the plane of Mean Low Water.

Hydrography from survey of April 29 & 30, 1968 by H. Fishlock.

Topography by aerial photography flown at 08:35 on May 23, 1966 at 4800 feet altitude.

Coordinates are on the Lambert Grid System for the Commonwealth of Massachusetts.

GRAPHIC SCALE

1" = 100' 100 0 100 200

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
C.T.M.	C.T.M.	T.C.S.

SUBMITTED
PROJECT ENGINEER

CHIEF, COASTAL DEVELOPMENT

EVALUATION STUDY OF RECENTLY COMPLETED SMALL NAVIGATION PROJECT ANDREWS RIVER HARWICH, MASS. POST-CONSTRUCTION SURVEY MAP (1968)

APPROVAL RECOMMENDED
CHIEF, PLANNING BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MAY, 1971

SCALE 1" = 100'

DRAWING NUMBER

SHEET 2 OF 3

PLATE NO. 3

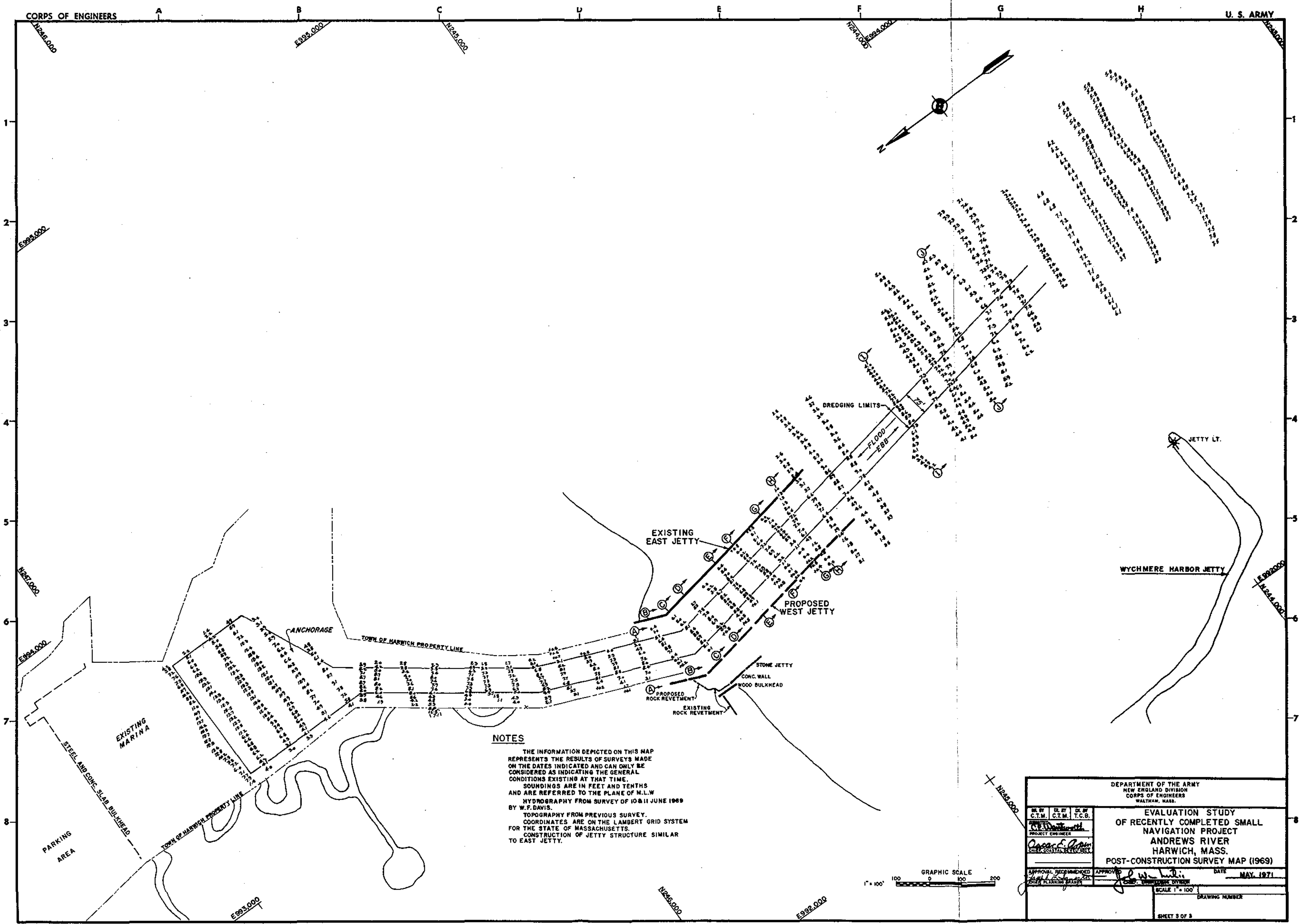

CORPS OF ENGINEERS
U. S. ARMY
EXISTING MARINA
PARKING AREA
STEEL AND CONC. SLAB BULKHEAD
TOWN OF HARWICH PROPERTY LINE
ANCHORAGE
EXISTING EAST JETTY
PROPOSED WEST JETTY
DREDGING LIMITS
FLOOD
EBB
PROPOSED ROCK REVETMENT
EXISTING ROCK REVETMENT
STONE JETTY
CONC. WALL
WOOD BULKHEAD
WYCHMERE HARBOR JETTY
JETTY LT.
NOTES
THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
SOUNDINGS ARE IN FEET AND TENTHS AND ARE REFERRED TO THE PLANE OF M.L.W
HYDROGRAPHY FROM SURVEY OF 10 & 11 JUNE 1969 BY W.F. DAVIS.
TOPOGRAPHY FROM PREVIOUS SURVEY.
COORDINATES ARE ON THE LAMBERT GRID SYSTEM FOR THE STATE OF MASSACHUSETTS.
CONSTRUCTION OF JETTY STRUCTURE SIMILAR TO EAST JETTY.
GRAPHIC SCALE
1" = 100'
100 0 100 200
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
C.T.M.
C.T.M.
T.C.B.
PROJECT ENGINEER
EVALUATION STUDY
OF RECENTLY COMPLETED SMALL
NAVIGATION PROJECT
ANDREWS RIVER
HARWICH, MASS.
POST-CONSTRUCTION SURVEY MAP (1969)
APPROVAL RECOMMENDED
CHIEF, PLANNING BRANCH
APPROVED
DATE
MAY, 1971
SCALE 1" = 100'
DRAWING NUMBER
SHEET 3 OF 3

PLATE NO. 4

CORPS OF ENGINEERS

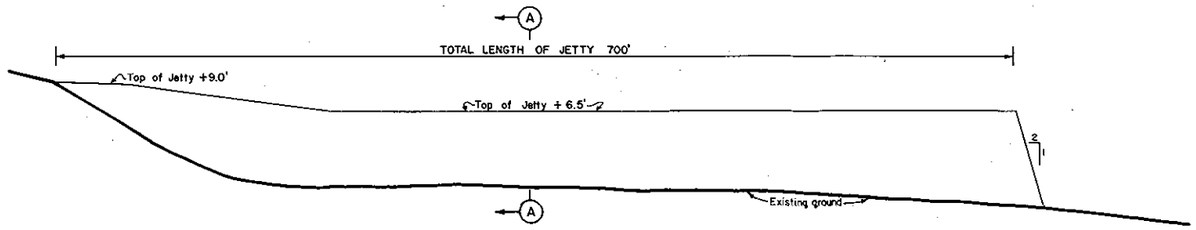
U. S. ARMY

A B C D E F G H

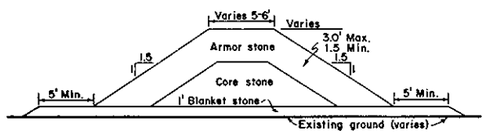
N246,000 E995,000 N245,000 N244,000 E994,000 N243,000

1 2 3 4 5 6 7 8

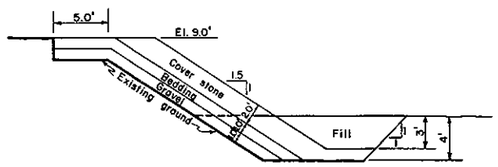
E995,000 N247,000 E994,000 E993,000 N245,000 E992,000 N244,000 E992,000 N255,000



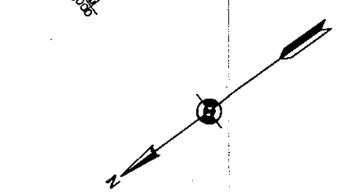
PROFILE WEST JETTY
SCALE IN FEET
HOR. 40 0 40 80
VER. 5 0 5 10

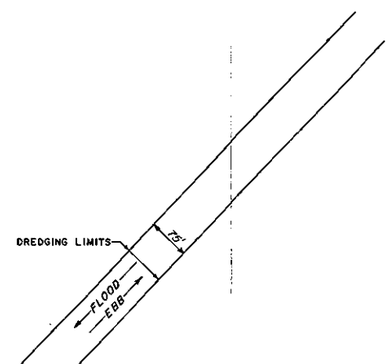


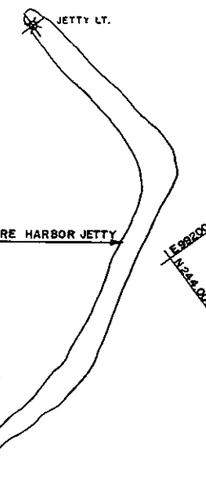
TYPICAL JETTY SECTION
SCALE IN FEET
HOR. 5 0 5 10

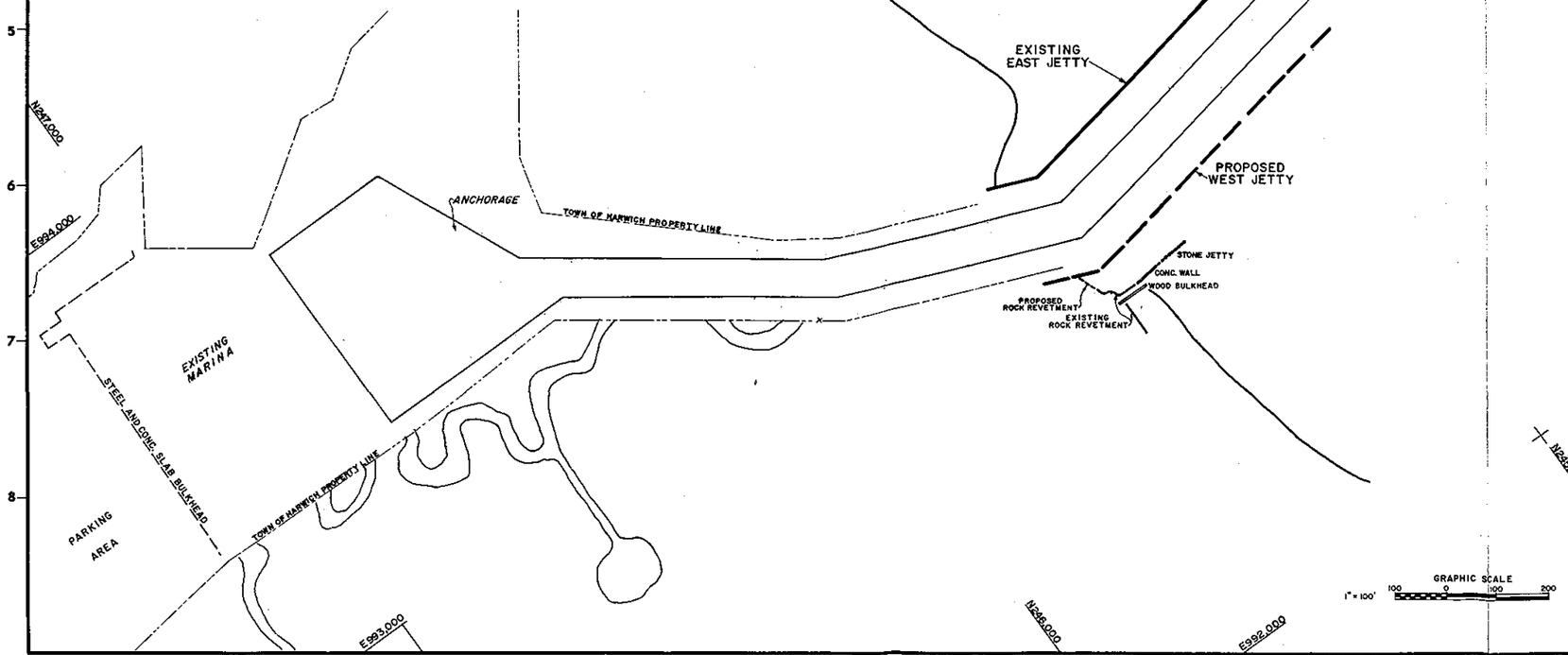


TYPICAL ROCK REVETMENT SECTION
SCALE IN FEET
HOR. 5 0 5 10









GRAPHIC SCALE
1" = 100' 100 0 100 200

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	CH. BY	CH. BY
C.T.M.	C.T.M.	T.C.S.

SUBMITTED
Project Engineer

Chief, Coastal Survey Sect.

APPROVAL RECOMMENDED
Chief, Planning Branch

APPROVED
Chief, Engineering Division

DATE MAY, 1971

EVALUATION STUDY
OF RECENTLY COMPLETED SMALL
NAVIGATION PROJECT
ANDREWS RIVER
HARWICH, MASS.
CONSIDERED PLAN

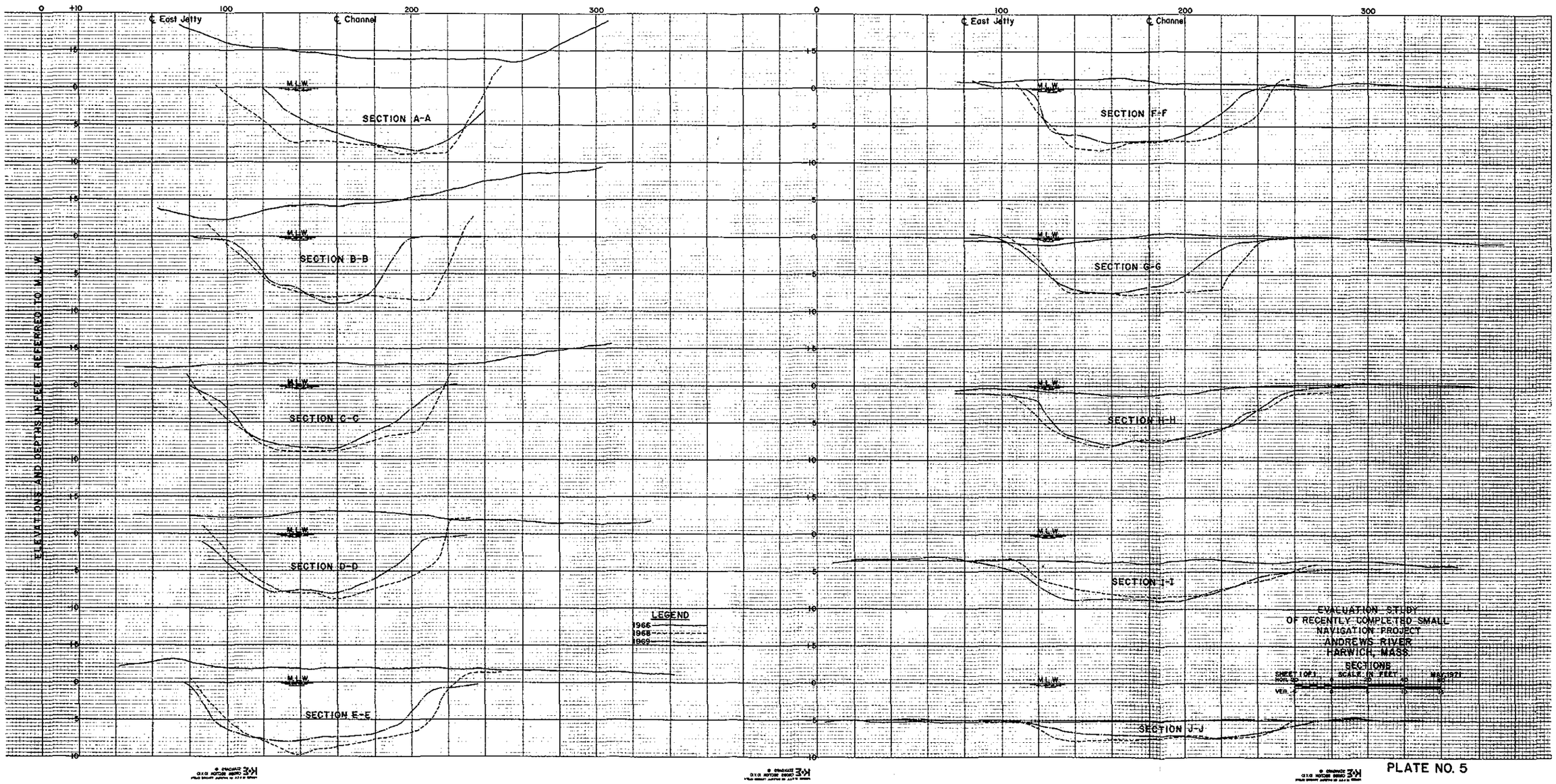
SCALE 1" = 100'

DRAWING NUMBER

SHEET 1 OF 1

PLATE NO. 9

DISTANCE IN FEET

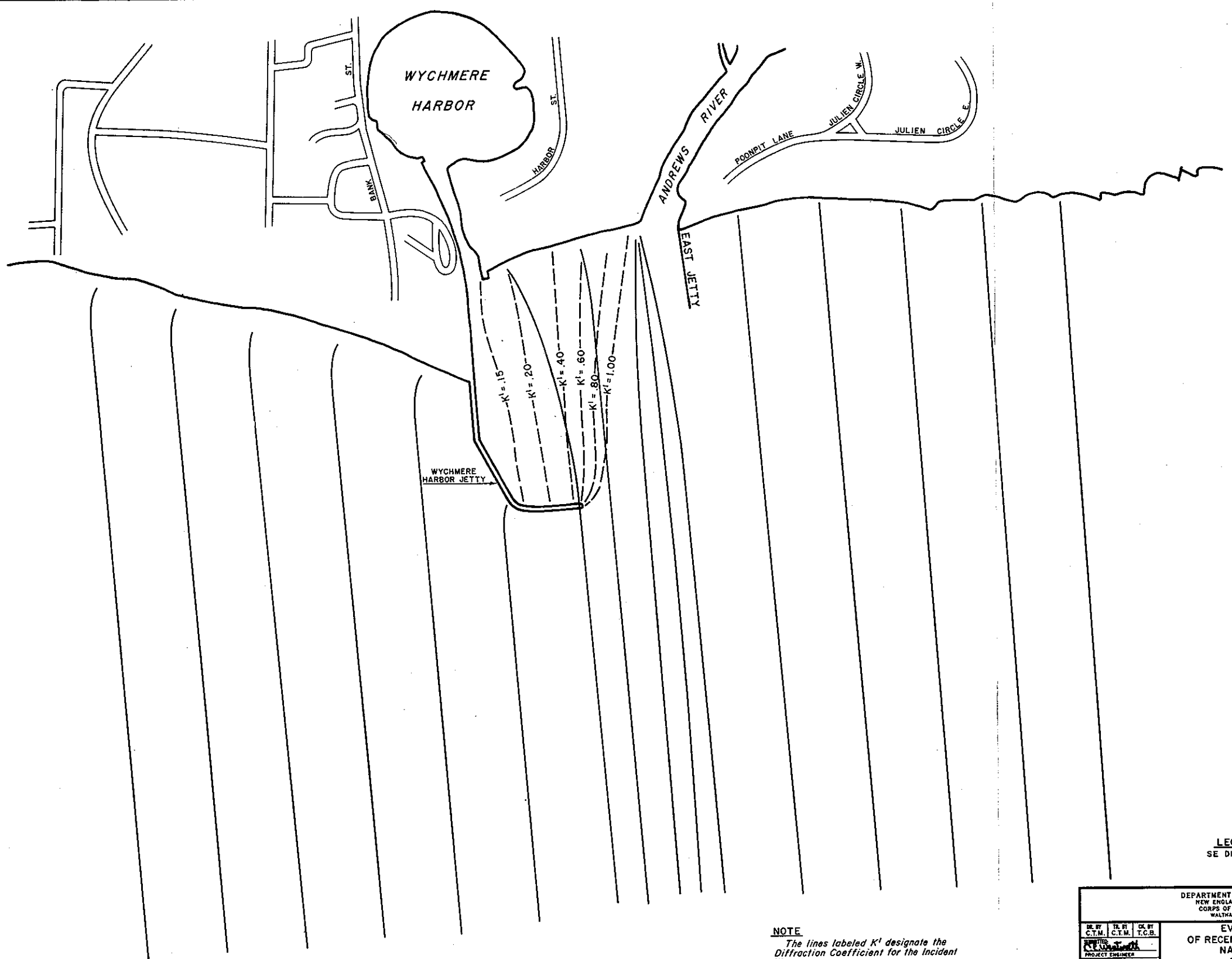


EVALUATION STUDY
OF RECENTLY COMPLETED SMALL
NAVIGATION PROJECT
ANDREWS RIVER
HARWICH, MASS.
SECTIONS
SHEET 1 OF 1
SCALE IN FEET
HOR. 1"=50'
VER. 1"=5'
MAY 1971

PLATE NO. 5

CORPS OF ENGINEERS

U. S. ARMY



LEGEND
SE DIRECTION

NOTE
The lines labeled K' designate the Diffraction Coefficient for the Incident Wave.

GRAPHIC SCALE
1" = 200'
200 0 200 400

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY C.T.M.	TR. BY C.T.M.	CK. BY T.C.B.

SUBMITTED
PROJECT ENGINEER
CHIEF, COASTAL DEVELOPMENT

EVALUATION STUDY
OF RECENTLY COMPLETED SMALL
NAVIGATION PROJECT
ANDREWS RIVER
HARWICH, MASS.
ORTHOGONAL PLOT

APPROVAL RECOMMENDED
CHIEF, PLANNING BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MAY, 1971

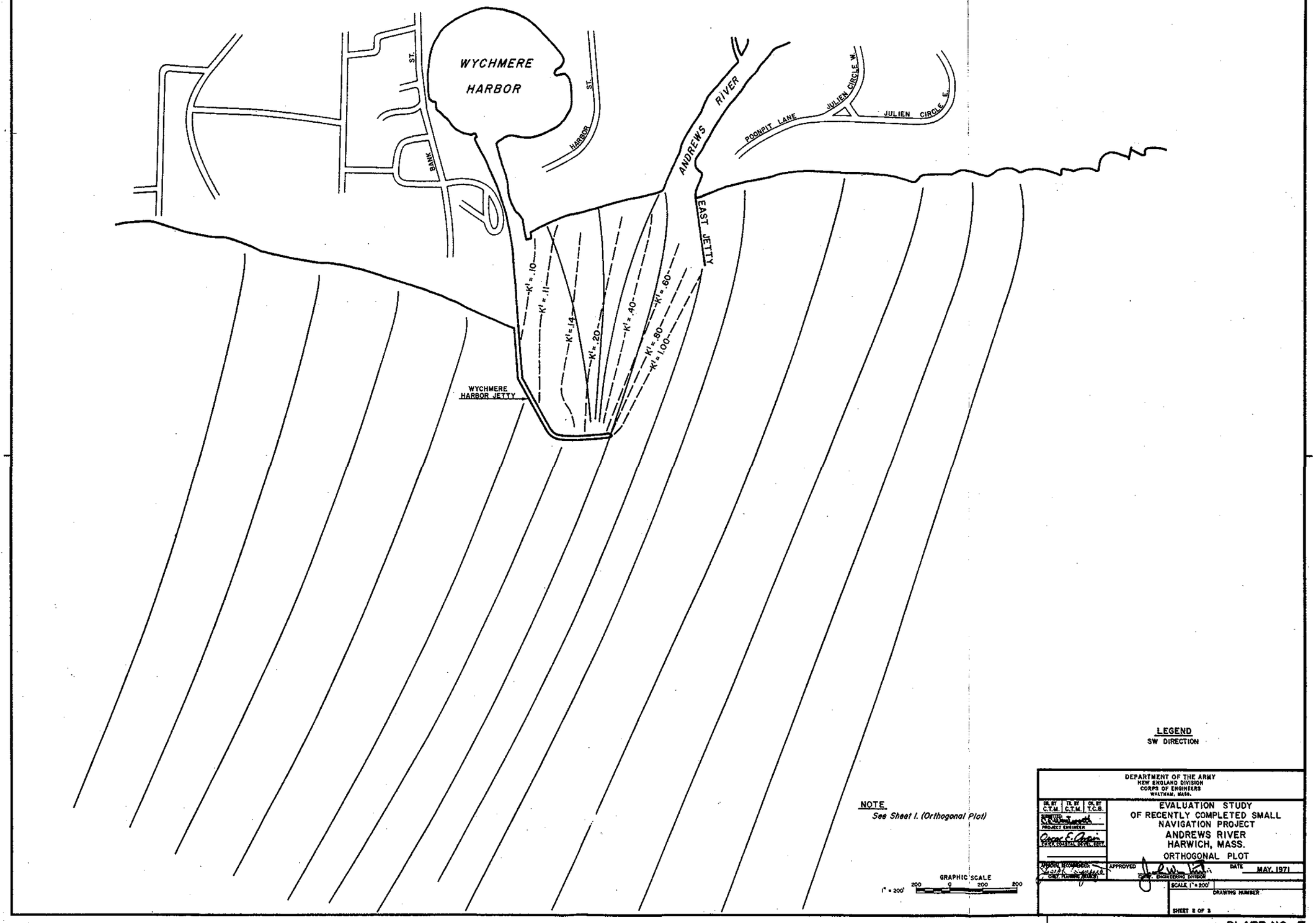
SCALE 1" = 200'

DRAWING NUMBER

SHEET 1 OF 3 SHEETS

PLATE NO. 6

CORPS OF ENGINEERS U. S. ARMY



LEGEND
SW DIRECTION

NOTE.
See Sheet I. (Orthogonal Plot)

GRAPHIC SCALE
1" = 200'
200 0 200 400

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY C.T.M. | TR. BY C.T.M. | CK. BY T.C.B.

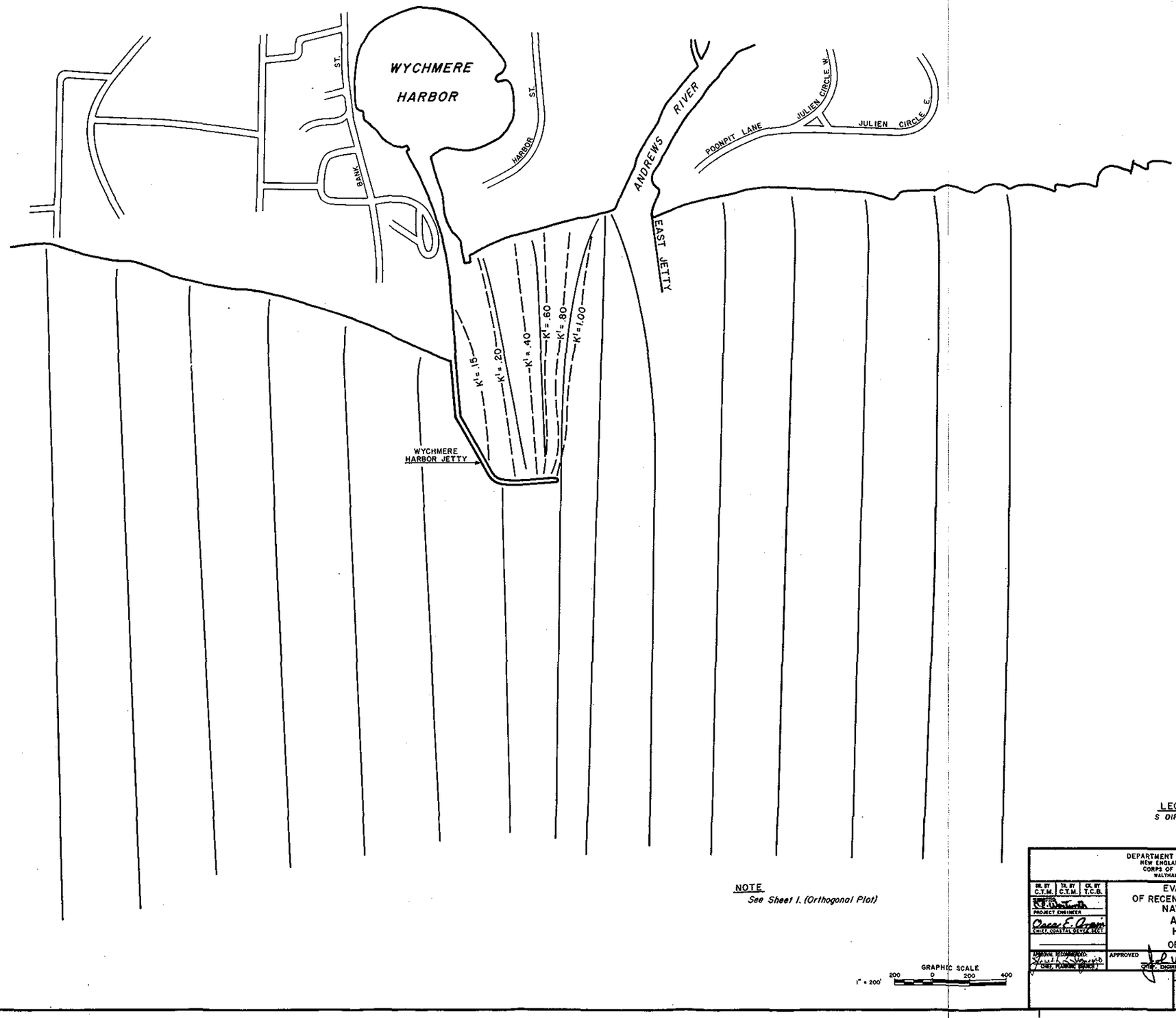
EVALUATION STUDY
OF RECENTLY COMPLETED SMALL
NAVIGATION PROJECT
ANDREWS RIVER
HARWICH, MASS.
ORTHOGONAL PLOT

SUBMITTED: PROJECT ENGINEER
CHIEF, COASTAL DEVEL. BRCH.
APPROVAL RECOMMENDED: CHIEF, PLANNING DIVISION
APPROVED: CHIEF, ENGINEERING DIVISION
DATE MAY, 1971
SCALE 1" = 200'
DRAWING NUMBER
SHEET 2 OF 3

PLATE NO. 7

CORPS OF ENGINEERS

U. S. ARMY



LEGEND

S DIRECTION

NOTE

See Sheet 1. (Orthogonal Plot)

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
C.T.M.	C.T.M.	T.C.B.

EVALUATION STUDY
OF RECENTLY COMPLETED SMALL
NAVIGATION PROJECT
ANDREWS RIVER
HARWICH, MASS.
ORTHOGONAL PLOT

SUBMITTED: PROJECT ENGINEER

APPROVED: CHIEF, COASTAL DESIGN SECT.

APPROVAL RECOMMENDED: CHIEF, PLANNING BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE MAY, 1971

SCALE 1"=200'

DRAWING NUMBER

SHEET 3 OF 3

PLATE NO. 8